Terahertz Imaging Nondestructive Tomography (TINT), Phase I

Completed Technology Project (2018 - 2019)

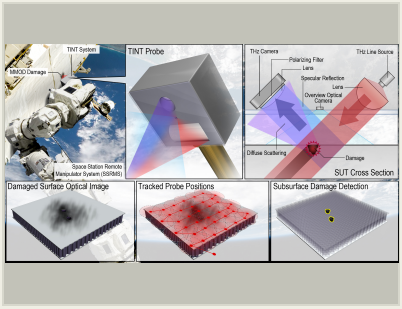
Project Introduction

To address the NASA need for advanced nondestructive evaluation (NDE) sensor technologies for structural components of space flight hardware, Intellisense Systems Inc. (ISS) proposes to develop a new Terahertz Imaging Nondestructive Tomography (TINT) system, based on the novel integration of new compact terahertz (THz) source and THz/optical imaging sensors, and comprehensive capture and analysis software. TINT utilizes THz and optical imaging sensor fusion to enable quick identification of surface locations of potential defects or damages, followed by see-through THz 3D tomography of nonconducting parts for further evaluation. The TINT system integrates with a high-power THz illuminator, imaging sensors, and onboard position tracking to accurately register scanner/part relative positions and overlay sensor data to target locations. This advanced information processing and display aid the flight crew to precisely pinpoint defects and make critical assessments quickly. In Phase I, ISS plans to design the TINT system architecture, define subsystem requirements, acquire components, assemble a prototype, and develop software for sensor fusion and registration. The proof-of-concept prototype will be demonstrated in a laboratory environment, and a preliminary Phase II prototype, with its concept of operation to structures, will be described. In Phase II, ISS will refine the TINT design, enhance the subsystems, and develop an improved TRL-6 prototype for testing. Full reports of development and test results will be developed, together with a plan for applying the prototype to applicable structures or material systems. A commercialization plan will be made identifying and summarizing market opportunities.

Anticipated Benefits

The TINT system will enhance NASA's spacecraft NDE and structural reliability monitoring for both in-space and ground inspection and structure/material imaging tasks. Thus, it will be an indispensable tool with NASA's Space Technology, Human Exploration and Operations, and Science missions. TINT can also be applied to inspect the following NASA structures: International Space Station, Orion/Multi-Purpose Crew Vehicle (MPCV), and Dragon and other International Space Station visiting spacecraft.

As a fully integrated and automated NDE tomography system, TINT will be used in applications where see-through inspection and interior scanning of complex structures or material systems are needed to address safety and cost reduction through preventable maintenance. Commercial markets include aircraft or automobile body inspection, civil structure inspection, port or mailing security screening, chemical and biological substance tracing, as well as commercial space flight missions.



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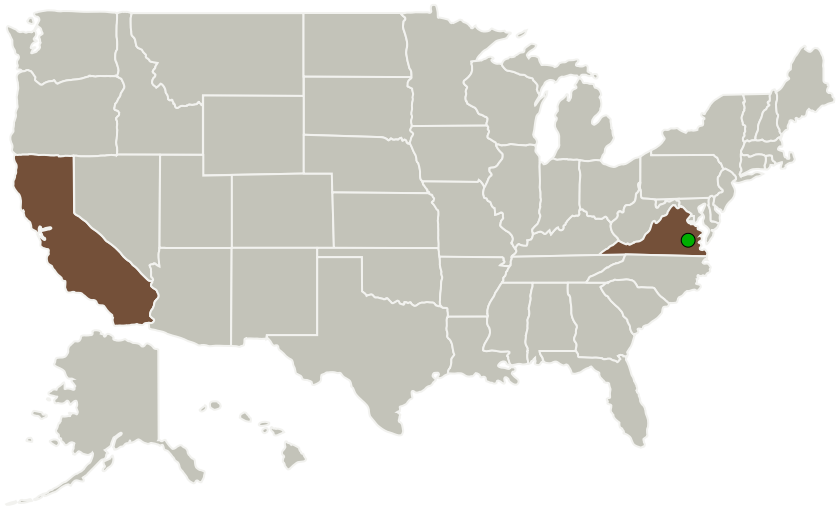
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Intellisense Systems, Inc.	Lead Organization	Industry	Torrance, California
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141178)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Intellisense Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

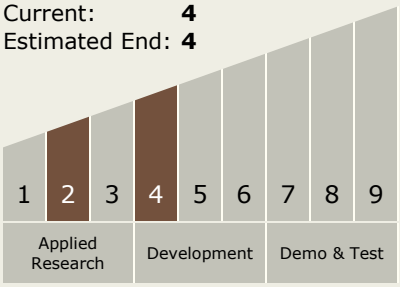
Carlos Torrez

Principal Investigator:

Ziran Wu

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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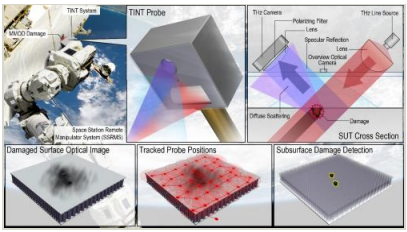
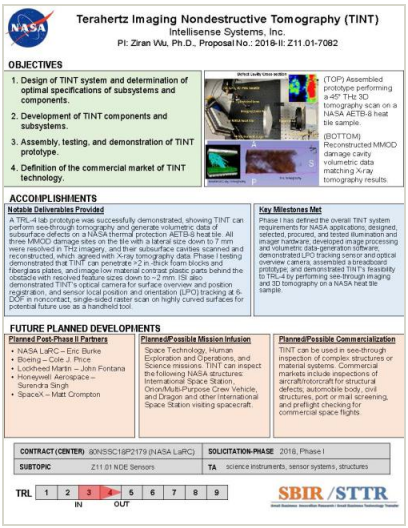
Images



Briefing Chart Image
Terahertz Imaging Nondestructive Tomography (TINT), Phase I
(https://techport.nasa.gov/image/134500)



Final Summary Chart Image
Terahertz Imaging Nondestructive Tomography (TINT), Phase I
(https://techport.nasa.gov/image/136279)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destination

Earth